Presupposition on Times and Degrees: The Semantics of Mandarin \( \text{hái} \)

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Mandarin adverb \( \text{hái} \) allows for two main interpretations when associated with gradable properties. Descriptive work usually discriminate between ‘temporal’ and ‘comparative’ readings of \( \text{hái} \), while the semantic core of the adverb has been defined in terms of scalarity. In this paper, our purpose is to give an understanding of the topic by providing the basis for an analysis of the adverb at the syntax-semantics interface. While subscribing to the generalization that \( \text{hái} \) is restricted to ordered domains, we will propose to characterize the adverb as a repetitive operator, that is, an additive operator the event domain; we will show that the possibility for \( \text{hái} \) to associate to gradable properties in comparative constructions can be explained on the bases of its repetitive use.

1. Introduction

Mandarin Chinese adverb \( \text{hái} \) can receive three main interpretations when associated with the same predicate, as it is the case for the gradable predicate \( \text{niánqīng} \) ‘(to be) young’ in (1) below.

(1) Zhāngsān hái \text{niánqīng}.

\text{Zhangsan HAI young}

The adverb in (1) conveys three distinct interpretations, which are partially disambiguated in (2)a-c, and which are traditionally associated with the so-called ‘temporal’ (2a), ‘comparative’ (2b) and ‘borderline’ (2c) readings of \( \text{hái} \).

(2) a. Zhāngsān hái \( \text{hěn} \) \text{niánqīng} (\text{tā kěndìng bu néng zhīdào}!)  

\text{Zhangsan HAI very young \ he of-course NEG possible know}

‘Zhangsan is still (very) young (of course he cannot know that!)’

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1 The author would like to thank the members of the group \text{Pluralité verbale: dépendances distributives}, and especially Lucia M. Tovena and Sylviane Schwer, for helpful comments on earlier versions of this proposal. I am also grateful to Marie-Claude Paris for her precious insights.
Previous semantic accounts have focused on the similar pragmatic inferences conveyed by the adverb in (2)a-c. Under this view, *hái* has been analyzed as a polysemous item which contributes an additive presupposition, paired with a scalar implicature, to the sentence (Paris 1988; Yeh 1998; Liu 2001). In this paper, we will present the outline of an analysis which takes this common intuition as a start, but which differs from the previous ones on sever respects.

Following the theoretical frame provided by Tovena and Donazzan (2008), we will define the semantic core of *hái* in terms of a repetitive adverb, that is, an additive operator which is specialized for the event domain. Application to verbal predicates leads, in our analysis, to the constraint of an ordering between presupposition and assertion, which is set by the ordering of time; aspectual restrictions, on the other hand, motivate the characterization of *hái* as on operator on intervals. We will show that the semantic content of *hái* in (2)a-c can thus be reduced to the simple operational scheme in (3).

(3)
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\begin{align*}
&\text{a} &\quad &\text{b} \\
&\bullet\\
&\text{--------------------------} &\text{--------------------------}
\end{align*}
\]

The proposed analysis has some important theoretical consequences which make it differ from the aforementioned proposals. First, being parasitic to an ordered domain, *hái* does not induce by itself an order among the set of alternatives introduced by its presupposition, and cannot be considered, in this respect, a scalar operator parallel to e.g. English *even*, as argued on the contrary by Liu (2001). As we will show by considering comparative constructions, then, *hái* does not contribute any explicit information about the position of the asserted and presupposed item on the scale: while the relative ordering of the two arguments is given by the relation structuring the domain, their position on the scale is left open, and possibly recovered by means of contextual information.

The paper is organized as follows. In section 2, we will consider the ‘temporal’ interpretation of *hái*, which will provide the basis of our characterization of the adverb. In section 3, we will then focus on the interpretation of *hái* in comparative structures, and we will show, in particular through a contrastive comparison with scalar degree modifier
that the basic characterization can be maintained also in this context. Finally, we will conclude by considering the borderline reading in section 4.

1.1 Ordered domains

Before turning to the analysis of hái, we think it is important to make explicit some of the assumptions that underline the formal analysis proposed in the following section.

Because of their intriguing semantic properties, additive adverbs such as Mandarin hái have been the object of several analyses in many languages. We won’t even attempt to give a critical review of this abundant literature here; for the present purpose, it may suffice to note that the most part of the existing accounts attribute to these adverbs a polysemic nature, which shows up in their ability to modify properties associated with different domains. To build a unified lexical entry for these items would then mean to reduce the differences between the domains to a common ground.

The hypothesis that the domain of T(ime) and the domain of D(egree) are conceptually similar is not a new one, and has been largely exploited, for instance, in recent semantic work that builds on the notion of graduation to explain aspectual alternations in the VP. As far as we are concerned, the similarity between the two domains can be considered to be a structural one: both T and D denote a totally ordered set of abstract individuals that, for formal purposes, have been converted into the logical types $t$ and $d$, respectively. Concerning the domain of Time, the ordering relation is generally taken to be one of precedence (Landman 1991); although in the case of Degree, as we will see, the matter seems to be more complicated, we will assume for now that the orientation of the scale is the same. The totally ordered set of times and degrees can thus be represented as in (4).

$$I \subseteq \mathbb{N}, \prec \in I \setminus \{i \neq i' \land (i < i') \lor (i' < i)\}$$

The definition in (4) represents the relation $\prec$ as an asymmetric and irreflexive relation, inducing a total order (or scale) on the set $I$, that, given what we have said, can be identified both with T or D. We will see in section *** that the condition of irreflexivity should be dropped when degrees are paired with concrete individuals in the denotation of gradable predicates, since one must allow somebody to be, for instance, as tall as himself. But since nobody is taller than himself, the definition in (4) will do for comparison of majority, which will be our main concern in the following discussion.

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3 Cf. for example the ‘affectedness’ account of (a)telicity by Krifka (1998) or the scalar analysis of achievements by Hay et al. (1999).
2. Temporal hai
Considering the interpretation of (2a), the generalization seems to be that the adverb receives an interpretation of continuity when the verbal predicate niánqīng ‘(to be) young’ is understood to be subject to a change in time (5a). This constraint is shown to be relevant by the fact that the adverb is infelicitous with predicates that typically do not allow for a change, such as lǎo ‘(to be) old’ in (5b).

(5) a. Zhāngsān hái niánqīng, děng yì huīr tā jiǔ hūi lǎo (yì diǎn).
   Zhangsan HAI young wait a while he then MOD old a little
   ‘Zhangsan is still young, he will be old(er) in the future.’

   b. #Zhāngsān hái lǎo (děng yì huīr tā jiǔ hūi sī.)
   Zhangsan HAI old wait a while he then MOD die
   (#Zhangsan is still old, he will die in the future.’)

The truth value and felicity conditions of (5a) can thus be expressed informally as in (6).

(6) Temporal hai.
‘Zhāngsān hái niánqīng’ is true under a temporal interpretation if ‘Zhangsan is young’ is true at \( t \) and there is another point in time \( t' \), which precedes \( t \), for which the proposition is also true.

If the characterization we give in (6) is correct, hái must be interpreted as an additive item, which contribution to the sentence is that of an ordered presupposition. The definition still needs to be made more precise, in particular for what concerns the aspectual properties of the predicate, in order to account for the continuative reading of the adverb.

The first observation is that the predicate in (5a) denotes a state, that is, a predicate that is traditionally considered a property of times rather than a property of events. If we look at the data, however, it seems that structural conditions on the predicate are in fact more relevant for the acceptability of hai than mere lexical distinctions. Eventive predicates, such as the (a)telic activities in (7)a,b are fine if they are modified by the progressive operator zài (Smith 1991), making them unbounded, strictly homogeneous events.

(7) a. Zhāngsān hái zài shuìjiào.
   Zhangsan HAI PROG sleep
   Zhangsan is/was still sleeping.
b. Zhāngsān hái zāi hē diyi wàn táng.
   *Zhangsan HAI PROG drink first CL.bowl soup*
   Zhangsan is/was still drinking the first bowl of soup.

The relevance of aspectual markers for acceptability shows that grammatical aspect plays a role. We could thus suppose that, in an extended VP projection (Travis 2000), the adverb falls in the outer AspP area.

(8) hai [ (- bound) VP]

The account we give for temporal *hai* as a predicate of intervals has two more consequences. First, it allows us to explain the infelicity of the adverb (and of aspectual adverbs in general, as observed in the literature) with so called ‘non-reversible’ predicates like *lǎo ‘(to be) old’* in (5b). In the discussion of example (5b), we dismissed the problem by saying the such predicates are not subject to temporal change; in fact, the correct characterization in our framework would be to say that ‘non-reversible’ predicate do not easily allow for a representation as convex intervals. The predicate ‘to be old’ in (5b), for instance, cannot reach an end without implying also the loss of its subject; this pragmatic condition is, to our mind, what blocks the possibility of a change. Finally, the characterization of *hái* in (8) has a consequence also for the hypothesis at the origin of our analysis. We accepted as a working hypothesis that the three interpretations in (2)a-c depend on the type of the predicate and the kind of predication, and are not a matter of structural ambiguity of *hái* as aspectual adverb or a degree modifier. In the next section, where we will analyze the semantics of *hái* as a modifier of gradable predicates, we will tackle this matter in more detail through a comparison with the degree adverb *gèng*.


In this section, we will concentrate on the semantic interpretation of *hái* in comparative constructions like (2b). Despite the great amount of literature devoted to aspectual adverbs like *hái*, the occurrence of these items in comparative constructions has often been neglected; on the contrary, we believe that the analysis of this occurrence of the adverb will provide a good way to test the assumptions we made for the temporal domain.

Let’s consider once more the interpretation of *hái* in (5b), repeated here in (9).

(9) Zhāngsān (bǐ Lìsī) hái niánqīng.
   *Zhangsan than Lisi HAI young*
   ‘Zhangsan is still younger (than Lisi).’
The contribution of *hái* in (9) seems to consist in the inference that the two compared items possess the property to be young at least to a positive degree. The inference is due to the adverb, as the contrast between (10a) vs (10b) shows.

(10) a. Lìsì bǐjiào ài, Zhāngsān bǐ tā gàō.
   
   *Lisi rather short Zhangsan than him tall*  
   Lisi is rather short, Zhangsan is taller than him.

 b. # Lìsì bǐjiào ài, Zhāngsān bǐ tā hái gàō.
   
   *Lisi rather short Zhangsan than him HAI tall*  
   (#Lisi is rather short, Zhangsan is still taller than him)

Contrasts such as the one in (10) motivate the interpretation of *hái* as a scalar adverb (Liu 2001), since *hái* is supposed to convey the information that the standard Lisi is positioned high on the scale defined by the property *gāo* ‘(to be) tall’. However, the contribution of the adverb, as we will show, must be stated in different terms. We will then describe informally the meaning contribution of *hái* in (9) in the following, more general way.

(11) *Comparative hái.*

Zhāngsān bǐ Y hái niánqīng’ is true iff ‘Zhāngsān bǐ Y niánqīng’ is true and ‘Y niánqīng’ is also true.

To understand the meaning contribution of the adverb in this context, we need to look more carefully to the syntax and semantics of comparatives constructions. Here we will concentrate on comparatives of inequality, since *hái* is restricted to this context, and we will take as prototypical form in our analysis the comparative of majority.

The basic difference between gradable and non-gradable properties is that the former denote sets of individuals which are (partially) ordered along a relevant dimension (Klein 1980). As such, each positive property, like *niánqīng* ‘(to be) young’ in (9), extensionally denote a set of individuals (those for which the property to be young holds in a given model), that in turn represents a convex interval on the dimensional scale of ‘youngness’. We will call this interval the ‘comparison class’ for the subject Zhangsan in (9).

We will point out here two main aspects of comparatives which seem to be shared by most languages. First, comparison classes are not equivalence classes: that is, two or more individuals belonging to the same comparison class, while sharing the same positive property, can be ordered one with respect to the other (12).
(12) Zhāngsān hé Lìsì dōu gāo, (kēshi) Zhāngsān bǐ Lìsì gāo (yi diǎn).

Zhangsan and Lisi both tall but Zhangsan than Lisi tall a little

Zhangsan and Lisi are both tall, but Zhangsan is (a bit) taller than Lisi.

On the other hand, the same lexeme denoting the positive form of the predicate is often ambiguous between a positive and a dimensional reading. Consider, in fact, (13) vs. (12).

(13) Zhāngsān hé Lìsì dōu ài, (kēshi) Zhāngsān bǐ Lìsì gāo (yi diǎn).

Zhangsan and Lisi both short but Zhangsan than Lisi tall a little

Zhangsan and Lisi are both short, but Zhangsan is (a bit) taller than Lisi.

In the comparative sentence (13), the same property gāo ‘(to be) tall’ characterizing Zhangsan and Lisi in (12) can be used to denote the dimension along which two non-tall individuals can be compared. In this sense, Zhangsan can be said to be ‘taller’ than Lisi, even when he himself is not positively tall. This apparent contradiction can be solved by postulating a polar opposition among positive (gāo ‘(to be) tall’) and negative (ài ‘(to be) short’) predicates along the same scale (Kennedy 2001), or simply as implying a marked positive form, capable of denoting also the scalar dimension (GAO, ‘tallness’). In this paper, we will adopt the latter view.

Drawing conclusion up to now, we see that the analysis of hái in terms of a repetitive adverb restricted to a convex interval can be plausibly extended to gradable predicates, once we take gradable properties to denote convex interval along a dimensional scale. The present analysis in fact accounts for the interpretation of hái that we make explicit in (11): to say that the two compared items must share the same positive property means, in the framework we adopted, that they belong to the same interval on the scale.

There seems to be still an unsolved problem, though. The analysis we outlined above does not exclude the possibility that hái behave like a ‘true’ scalar adverb, contributing explicit information about the two compared items on the scale. To make this point more explicit, we will make a contrastive comparison of hái and the scalar adverb gèng, which, while conveying a similar interpretation in some cases, behaves quite differently in many respects.

3.1 The scalar adverb gèng

The adverb gèng can be defined a degree adverb which is constrained, in general, to comparative constructions. In this context, gèng leads to an interpretation that looks at first sight very similar to that we have seen for hái in (9), cf. also (10b) vs. (14b) below.
Two contexts, however, allow seizing the semantic difference between the two adverbs. First, contrary to hái (15a), gèng does not allow the differential interval between the two compared item to be expressed by a measure phrase denoting a specific amount, such as sān cùn ‘three inches’ in (15b), cf. (Paris 1988).

The second context, as noted in particular by Yeh (1998) and Yu & Xia (2008), is provided by ‘hyperbolic’ comparative sentences as (16)a-b, in which the two compared items do not generally belong to comparable classes.

We will show that the difference between the two adverbs in these two linguistic contexts help understanding the semantics of gèng and hái, and provides more evidence for the analysis we proposed for the latter. Let’s consider the case of hyperbolic comparatives first. If we follow the hypothesis underlying our analysis, the semantic contribution of hái in (16) is to state explicitly that the subject and the comparison standard belong to the same interval on the scale, i.e. to the same comparison class. This could seem odd in the case of hyperbolic comparative propositions, whose rhetoric function is rather to state the extraordinary status of the subject by comparing it with an unusual standard, not belonging to the same
class of comparison. In fact, if hái is not present in the sentence, hyperbolic comparatives like (16) are less acceptable in Mandarin.

(17) ??Zhāngsān ah, bǐ húlí jiāohuá.

\textit{Zhāngsān EX than fox smart}

It seems, then, that hái in this context has the rhetoric function we would expect: the adverb makes explicit that the property \textit{jiāohuá} ‘(to be) smart’ in (16) should be interpreted as denoting an interval on the scale of smartness which includes both Zhāngsān and the prototypical fox. The scalar effect is then achieved in this way: by choosing an idiomatic standard and asserting that the subject can be compared with it because it belongs to the same comparison class, the speaker implicates that the subject also possess the relevant property to a high degree.

Why is it the case that gèng is then infelicitous in the same context? We venture the hypothesis that the infelicity of gèng is due to the fact that, contrary to hái, gèng is a degree adverbial with scalar implications.

Recall that, contrary to hái, gèng only modifies gradable predicates, and, as a degree adverb, is restricted in particular to comparative propositions. The bare (i.e. unmodified) gradable predicate is generally taken to be ‘inherently’ comparative in Mandarin (Li & Thompson 1981, a.o.), that is, a silent comparative morpheme, which introduces the standard \textit{bǐ}-phrase, can be supposed to be present in (18a). The correspondent non-comparative form is marked, either by contrastive focus or, more frequently, by degree adverbials, such as hěn ‘very’ in (18b). 4

(18) a. Zhāngsān gāo.

\textit{Zhāngsān tall}

‘Zhāngsān is taller’

b. Zhāngsān hěn gāo.

\textit{Zhāngsān very tall}

‘Zhāngsān is (very) tall’.

We take the (silent) comparative morpheme to have the role of introducing compositionally the standard of comparison.

The fact that gèng is restricted to comparative constructions seems then to imply that the adverb modifies the standard of comparison. We would propose to characterize the scalar contribution of gèng in this way: the adverb conveys the information that the

4 The adverb hěn in (12b), if unstressed, loose its interpretation as degree adverbial meaning ‘very’, and seems to have the sole function to mark the non-comparative reading of the predicate. As such, it has been compared (see e.g. Sybesma 1999) to the null \textit{pos} operator that ensures the positive interpretation of gradable predicates in relational analyses (Stechow 1984).
standard must be considered as the highest element of its comparison class in a given context. By saying that the subject surpasses the standard, the speaker thus implies that it is also outstanding all comparable items in the same context, and that, consequently, the subject and the standard do not belong to the same comparison class.

Once we accept to state the semantics of gèng in these terms, the restrictions we noted in (15b) and (16b) above can receive an explanation. First, gèng cannot ‘rescue’ hyperbolic comparatives the way hái does. Rather than implying by its meaning contribution that the two items belong to the same comparison class, gèng builds its scalar effect on the semantics of basic comparatives, which, as we have seen, are independently infelicitous when the subject and the standard are pragmatically not comparable.

The unacceptability of gèng in sentences like (15b), where the differential between the two compared items is expressed by a specific dimensional phrase, may also fall into the account of the adverb that we proposed. Comparatives of inequality always imply, as part of their semantic content, the existence of a differential between the two compared items. The differential may surface explicitly as a measure phrase, cf. (19)a,b.

   Zhangsan than Lisi tall a little
   ‘Zhangsan is a bit taller than Lisi’

   b. Zhāngsān bǐ Lí sī cóngmíng yì diàn.
   Zhangsan than Lisi intelligent a little
   ‘Zhangsan is a bit more intelligent than Lisi.’

The measure phrase yì diǎn ‘a little’ in (19)a,b explicitly denote the extent of the interval representing the differential between Zhangsan and Lisi along the scale of tallness and intelligence, respectively. So called ‘dimensional’ properties like gāo ‘(to be) tall’ in (19a) also allow for measure phrases such as the measure phrase sān cùn ‘three inches’ in (20)⁵, denoting more specifically the extent of the interval along the gradable dimension.

(20) Zhāngsān bǐ Lí sī gāo sān cùn
   Zhangsan than Lisi tall three inch
   ‘Zhangsan is a bit taller than Lisi’

As we have seen in (15b) above, gèng is unacceptable in sentences where the differential is expressed by specific measure phrases like sān cùn ‘three inches’(21a); on

⁵ See Bierwisch & Lang (1989).
the other hand, it can occur with non-specific differential measure phrases, like *yi diān ‘a little’ in (21b).

(21) a. *Zhāngsān bǐ  Lìsī  gēng  gāo sān cùn
   Zhangsan than  Lisi GENG tall  three inch

b. Zhāngsān bǐ  Lìsī  gēng  gāo  yi diān
   Zhangsan than  Lisi GENG tall  a little
   ‘Zhangsan is event a bit taller than Lisi’

From a syntactic point of view, both *sān cùn ‘three inches’ and *yi diān ‘a little’
are two post-verbal phrases expressing a measure complement. The reasons for the
contrast of acceptability between (21a) vs. (21b), then, should rather be found on the
semantic side.

Once more, we believe that the semantic characterization we gave for the adverb
may help in finding an explanation. Recall that in our analysis *gēng contributes the
information that the standard and the subject of comparison do not belong to the same
interval on the dimensional scale. This may be the reason why specific differential
measure phrases are ruled out: it is impossible to measure out the interval intervening
between two standards that do not belong to the same scale. On the contrary, the mere
existence of a differential, which is always implied, may be explicitly stated also in this
case, as (21b) shows.

Finally, we should note that, if our analysis is on the right track, the
grammaticality of *hái in (15a) follows: contrary to *gēng, the adverb *hái asserts that the
compared items both belong to the same interval on the scale. The quantification of the
differential interval is thus not excluded.

4. Borderline reading of *hái.

The last example of occurrence of *hái that we need to consider is the so called
‘borderline’ reading of the adverb, exemplified by (2c), repeated here in (22).

(22) Zhāngsān  hái  (suàn)  niánqīng.
   Zhangsan  HAI  to-consider  young
   ‘Zhangsan is still (to be considered) young.’

The borderline reading of the adverb is supported by the intuition that Zhangsan
in (22), while belonging to the group of young people, represents in some way a
‘marginal’ example of youth (Liu 2001). Being a marginal example of youth means that,
in the denotation of ‘young’ in a particular context, one must include other individuals
which are better example of youth that Zhangsan, i.e. that are probably younger than him.
While sentence in (22), on the basis of this shared intuition, has sometimes been considered a special case of comparative construction (one in which the comparison standard is left implicit), we will maintain here that the existence of a comparison standard is not due to the (silent) presence of a comparative morpheme, but it is only the result of the presupposition of hái. We will then propose to describe the meaning contribution of hái in (22) as in (23).

(23) Borderline hái.

‘Zhāngsān hái niánqīng’ is true iff ‘Zhāngsān niánqīng’ is true and in the denotation of ‘niánqīng’ there is at least another individual y for which ‘y hái niánqīng’ is true.

Under this view, the characterization of hái that we proposed for the temporal and comparative readings of the adverb can be maintained also in this context, but with one important difference. If we accept the definition of borderline hái we give in (23), in fact, we should also admit that the ordering relation between the presupposed and asserted item be reversed. The presupposed item y is interpreted as possessing the relevant property to a higher degree than Zhangsan: in other terms, we could say that the orientation of the scale represented by the predicate ‘(to be) young’ is opposite to that of comparatives of superiority, going from ‘young’ to ‘old’ rather than from ‘old’ to ‘young’.

If his observation is correct, then, the borderline reading of hái may confirm another important point that we stressed in the introduction: hái is not inherently scalar, in that it does not introduce an order among the alternatives, but rather relies on the order independently structuring the domain.

5. Conclusions

In this paper, we sketched a proposal for a unified analysis of the adverb hái in terms of a repetitive adverb, that is, an additive restricted to an interval in an ordered domain. In our analysis, hái contributes the information of the existence of a presupposed item y, of the same type of the asserted one and ordered with respect to it by a relevant ordering relation.

Following this hypothesis, we showed that the interpretation of hái in its temporal, comparative and borderline readings can be reduced to the same operational scheme (24).

(24)

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The proposed analysis brings two consequences that make it differ from previous ones on two important respects: first, hái does not convey any explicit information about
the position of (a) and (b) on the scale defined by the interval. This point has been made clear in particular through a comparison between hái and the scalar adverb gèng in the context of comparative constructions. In paragraph 3.1, we proposed a contrastive comparison between hái and the adverb gèng, which we analyzed as a scalar degree adverbial. We argued in particular that a similar scalar effect is conveyed by the two adverbs by exploiting two different strategies. In the context of gradable predicates denoting intervals on a dimensional scale, hái contributes the information that both the presupposed and the asserted item belong to the same interval identified by the positive reading of the predicate. On the contrary, gèng is limited to comparative constructions, and in this case scalar effect is obtained by explicit information about the position of the standard on the scale.

The second consequence is that hái does not introduce explicitly an ordering among the alternatives, but rather relies on the ordering independently structuring its domain of application. For these reasons, we defended the hypothesis that hái cannot be considered a scalar adverb, but rather an additive adverb specialized for an ordered domain.

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